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APR - 4 2007 GE: 135248-2 (SPLG 1035US1)
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Kjell Kristoffersen   :
                                          :   Art Unit: 3768
Serial No.: 10/719,434   :
                                          :   Examiner: Jaworski, Francis J.
Filed: November 21, 2003   :
                                          :
For: ULTRASOUND METHOD AND   :
        APPARATUS FOR MULTI-LINE   :
        ACQUISITION   :

Mail Stop: AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Sir:

Applicant requests review of the final rejection in the above identified application. No amendments are being filed with this request. This request is being filed with a Notice of Appeal.

Review is requested for the following reasons stated on the attached five (5) sheets.

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GE: 135248-2 (SPLG 1035US1)
PATENT

Remarks

In a Final Office Action dated January 5, 2007, the Examiner rejected pending Claims 1-6, 8-17 and 19-20 under 35 U.S.C. §101 as allegedly not being statutory subject matter. In the previous Office Action dated July 7, 2006, the Office rejected Claims 1-6, 8-17 and 19-20 under 35 U.S.C. §101 as allegedly claiming non-statutory subject matter. Applicant filed a response, on Monday October 9, 2006, the first business day after Saturday October 7, traversing the rejection and discussing some of the reasons why the pending claims are patentable subject matter. After considering the Examiner's rebuttal to Applicant's arguments, Applicant submits that a case for rejecting the claimed invention as directed to non-statutory subject matter has not been made by the Examiner.

The Office Action states that Claims 1-6, 8-17 and 19-20 do not transform an article into a different state or thing. The Office goes on to state that if there is no physical transformation, a "useful, concrete and tangible result" must occur for the claims to be patentable subject matter. The Office states that providing "a particular decimated data stream as a result (Claim 1) or structure for providing a decimated and mixed data stream (Claim 6) or structure or method for providing a filtered/multiplexed/decimated data stream result (Claims 12, 17)" are directed to non-statutory subject matter "since no concrete or tangible result such as a diagnosis performed on a patient or a display device producing a display based upon the altered data stream is claimed." Applicant respectfully disagrees.

Rather than discuss claim by claim, Applicant will discuss the features of the claimed invention that produce and manipulate the claimed decimated data stream, as this or a similar feature runs throughout the rejected claims.

The decimated data stream results from a physical transformation and is thereby statutory subject matter

The present invention relates to a method and apparatus for acquiring and processing ultrasound data streams to reduce the bandwidth of the data. The data streams are generated by a beamformer. Independent Claims 1 and 17 recite methods for acquiring ultrasound data. Specifically, Claim 1 requires decimating the first data stream by passing at least two consecutive data samples and by removing at least two other consecutive data samples therefrom

2

to form a first decimated data stream. Claim 17 recites a method for acquiring ultrasound data that includes, among other things, decimated first and second filter to data streams to form first and second decimated data streams and multiplexing the first and second decimated data streams. Dependent Claims 2-5 depend from independent Claim 1, and dependent Claims 19 and 20 depend from independent Claim 17.

Independent Claims 6 and 12 recite an ultrasound system. Claim 6 recites an ultrasound system that includes, among other things, a decimator for passing consecutive data samples from at least one of a first and second data streams and for removing consecutive data samples from at least one of the first and second data streams. Claim 12 recites a demodulator for demodulating data streams that includes, among other things, a multiplexor that interleaves the data stream with a time dependent signal and a filter that filters the data stream, where the filter comprises coefficients having two consecutive data samples representative of the desired impulse response interleaved with two consecutive data samples that are zeros. Dependent Claims 8-11 depend from independent Claim 6 and dependent Claims 13-16 depend from independent Claim 12. Both the method and system claims utilize known hardware components to create and manipulate the data stream. The transducer, receiver, filter, multiplexor, demodulator, and decimator are known physical structures that fall squarely within the mandates of 35 U.S.C. §101 as examples of statutory subject matter.

Section 101 of Title 35 defines patentable subject matter as "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." The Supreme Court has interpreted the term "manufacture" in accordance with its dictionary definition to mean 'the production of articles for use from raw or prepared materials by giving to these material new forms, qualities, properties, or combinations, whether by hand-labor or by machinery." *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980) (quoting *AM. Fruit Growers, Inc. v. Brogdex, Co.*, 283 U.S. 1, 11 (1931)). As the *Chakrabarty* Court observed, the "expansive" scope of the term "manufacture" reflects Congress's [sic] intent that patentable subject matter "include[s] anything under the sun that is made by man." *Id.* at 308-09 (quoting S. Rep. No. 82-1979 at 5 (1952); H.R. Rep. No. 82-1923 at 6 (1952)). This definition of manufacture encompasses ultrasound signals, which are things made by man.

3

A signal, as defined by Merriam-Webster's dictionary is "a detectable physical quantity or impulse (as a voltage, current, or magnetic field strength) by which messages or information can be transmitted". *Merriam-Webster's Collegiate® Dictionary*, Eleventh Edition (2005). The fundamental purpose of any signal is to convey information. The ultrasound signals are transmitted into an area of interest, and transformed by the structures within a human body to produce an ultrasound echo signal that is received and subsequently converted to a data stream. The data stream is a detectable, measurable signal that includes information regarding the contours of the structures within a body. Therefore, the data stream is a signal that conveys information and is patentable subject matter as defined by 35 U.S.C. §101.

Furthermore, the Office is mistaken in stating that there is no physical transformation that takes place. The data stream is produced from an analog ultrasound signal that is transmitted into a body. The transmitted ultrasound signal is first transformed by the structures within the body to form an analog echo signal that includes information regarding the contours of the structures in the body. After the echo signals are received, additional transformations occur. The echo signals are transformed by a beamformer to produce the data stream. The resultant output data stream is not an abstract number but is a signal that represents a transformed representation of structures within the body. Further the Office states "since no concrete or tangible result such as a diagnosis performed on a patient or a display device producing a display based upon the altered data stream is claimed," Claims 1, 6, 12, and 17 are directed to non-statutory subject matter. Again, the Office is mistaken, for the data stream itself is a concrete and tangible result that can be stored and manipulated. As shown in Figures 1, the ultrasound signal is emitted by a transmitter 102 and the ultrasound echoes, produced by structures in the body, are received by receiver 108. The received ultrasound echoes are processed through a beamformer 110 that outputs an RF signal, the data stream, to a RF buffer 114 for storage. Thus, the data stream signal may be stored and maybe retrieved to be used at a later time.

Figure 5 illustrates how a data stream is produced and how the data stream is manipulated. Figure 5 depicts the contents of a partial beamformer that takes the echo signal and produces an initial data stream. After passing the received signal through a per-channel beamformer and a beamsummer, a partial beamsum 208 signal is produced. Then, the partial beamsum signal 208 is passed through a programmable anti-aliasing filter 252 to remove

4

frequencies above 10MHz and an initial data stream is produced. The anti-aliasing filter 252 has three different pass bands: a low-band (e.g., 0-10MHz), a mid-band (e.g., 5-15MHz), and a high-band (e.g., 10-20 MHz). The decimator 254 functions to remove a different number of consecutive data samples in the data stream signal based on the pass band selected. The decimator 254 functions as a mathematical multiplier to the data stream to decimate selected data samples in the data stream. For the low-band and high-band, the decimator multiples the data stream [A1 A2 A3 A4 A5 A6 ...] with a binary sequence [1 0 1 0 1 0 ...] that results in a decimated data stream sequence of [A1 X A3 X A5 X ...], which eliminates every other data sample in the initial data stream. And, for the mid-band, the decimator multiplies the data stream [A1 A2 A3 A4 A5 A6 ...] with a binary sequence [1 1 0 0 1 1 ...] that results in a decimated data stream sequence of [A1 A2 X X A5 A6 ...], which passes two consecutive data samples and then eliminates two consecutive data samples in the initial data stream. Therefore, the data stream is manipulated to produce one or more selected decimated data streams. The decimation process may be performed at any stage of the beamforming process and functions to reduce the bandwidth of the data.

The Boolean multiplication of the data stream clearly produces a useful, concrete, tangible result of a decimated data stream that falls within the scope of §101. This is similar to the use of a Boolean operator to determine the value of the PIC indicator. *See AT&T Corp., v. Excel Communications, Inc.,* 172 F.3d 1352, 1358, (Fed. Cir. 1999). Furthermore, the transformation of the ultrasound signal to a decimated data stream is similar to the transformation of electrocardiograph signals from a patient's heartbeat by a machine through a series of mathematical calculations. *See Arrhythmia Research Tech., Inc. v. Corazonix Corp.,* 958 F.2d 1053 (Fed. Cir. 1992). The Arrhythmia Court "reasoned that the method claims qualified as statutory subject matter by noting that the steps transformed physical, electrical signals from one form to another form – a number representing a signal related to the patient's heart activity, a non-abstract output." *See AT&T Corp.* at 1358 (quoting *Arrhythmia,* 958 F.2d at 1059). Just as the conversion of the analog ultrasound signals to a decimated data stream are related to the underlying structure of the body, the Court specifically stated: "[t]he electrocardiograph signals are first transformed from analog from, in which they are obtained, to the corresponding digital signal. These input signals are not abstractions; they are related to the

5

GE: 135248-2 (SPLG 1035US1)
PATENT

patient's heart function." *Arrhythmia* at 1059. In addition, the Court went on to state that the "steps of "converting", "applying", "determining", and "comparing" are physical process steps that transform one physical, electrical signal into another. The view that "there is nothing necessarily physical about 'signals'" is incorrect." *Id.* (quoting *In re Taner*, 681 F.2d 787, 790 (CCPA 1982).
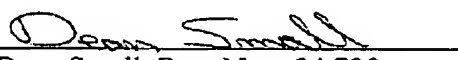
As described above, the data stream is a concrete, tangible result culminating from the transmission and reception of an ultrasound signal. The data stream is a signal that carries information and can be manipulated. In addition, the data stream is created and manipulated by known physical structures that form an apparatus. Thus, Claims 1-6, 8-17 and 19-20 are patentable subject matter as defined by 35 U.S.C. §101.

Conclusion

Applicant believes that the rejection of Claims 1-6, 8-17 and 19-20 under 35 U.S.C. §101, **must be reversed** as the Examiner has failed to make a prima facia case of non-statutory subject matter. Applicant respectfully disagree with the entire characterization by the Examiner that there is no physical transformation therefore no "useful, concrete and tangible result" occurs and that the claims are not patentable subject matter. As described above, the decimated data stream results from a physical transformation and is thereby statutory subject matter.

Respectfully Submitted,

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6